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REVIEW OF THE MONITOR RESEARCH PROJECT

The Monitor Research Project proposes to monitor the radioactivity in the marine organisms and water of the Central Western Pacific Ocean. A three year program of sampling in the area from the Christmas Islands to the Phillipines and from New Guinea to Okinawa is proposed. An extensive collection of organisms from the reef, lagoon, and high seas would be made. Three budgets have been submitted: $2,270,000; $1,240,00 and $444,000. Only the first can be considered a total cost budget as the cost of radiological analyses or boat charter or both have not been included in the last two budgets.

The AEC has an interest in the general program suggested by Dr. Harry in this proposal because the radioactive contaminants from the testing program may find their way back to man by way of the food chain. Therefore, the AEC has the responsibility to know how this may happen an to know how much radioactivity and what isotopes are present in the orga isms of the food chain. For the purpose of evaluating these conditions there has been a radiobiological survey for all of the past weapons test ing programs in the Pacific. An expansion of the program for radiobiolo surveys is proposed.

In reading the proposal several questions come to mind: (1) Is the present program adequate? (2) If not, is the Monitor Research Project adequate? and (3) if an expanded program is needed are funds available?

The present program has been based upon the results of earlier surveys. In the beginning emphasis was on the quantitative distribution of fission products in marine organisms. Shortly afterwards the program

was expanded to include terrestrial plants and animals and extensive collections were made of both land and aquatic organisms. As the pattern of distribution evolved, geographically, within species, between species and in tissues, key species were selected and the number of samples reduced. Also, the time between sampling periods was lengthened as the constancy of the decline curves (time on the abscissa activity on the ordinate) made it possible to reliably predict future levels of activity.

With the accumulation of information on the quantitative distribution of fission products, more emphasis was then placed on finding out what isotopes were present. Currently fewer samples are taken but more complete analyses are being made. The decrease in the number of samples taken in any one area has been offset by an increase in the number of areas sampled.

For Operation Redwing, radiobiological surveys were made before, during and after the operation at several atolls in the Marshall Islands, at one island in the Carolines and at one island in the Gilberts. As a continuation of this part of the program a limited collection of samples will be made during July 1957. Also, samples were collected periodically during the year following Redwing at five islands, including Guam, which are 1100 to 1600 miles west of Eniwetok. Two oceanographic surveys for the purpose of obtaining water and plankton samples in the Bikini-Eniwetok area and to the westward were made, one during and one after operations.

Plans for future surveys are in general similar to those for Redwing but it is hoped that the high seas tuna fishery can also be sampled and

more emphasis can be placed on the deep water sampling near the test site. Although the program should remain flexible in order to accommodate emergency situations and to follow leads indicated by the survey work, the general program has four phases which are as follows:

I. Island, reef and lagoon surveys of the Marshall Islands and adjoining areas in the Carolines and Gilberts. Samples to be collected pre-test, post-test and one year post-test.

II. Oceanographic and fishing surveys in the Test Site area and to the westward, pre-test and post-test.

III. Marine surveys in the Western Pacific a thousand or more miles west of the test site to be taken periodically during the year following the testing program.

IV. Surveys to be taken on an "as needed" basis. These would include (1) emergency situations that occur during the testing program such as at Rongelap in 1954 and (2) the extension of sampling to areas other than the scheduled survey areas when the results of the scheduled surveys suggest that this should be done.

Is the present program adequate? Probably no reasonable program can be entirely adequate because the problem and its ramifications are so vast. Therefore, the question should be asked, "Is the present program adequate to provide the information needed by the AEC to fulfill their responsibilities?"

The answer is a qualified no if reference is made to the programs up to the present. However the above program for future radiobiological

surveys, which differs from the present program in that fishing for high seas tuna has been added and more emphasis has been given to deep water sampling in the test site area, is believed to be reasonable and adequate to provide the information needed by the AEC to fulfill their responsibilities. The program outlined above for future surveys has been submitted by the Division of Biology and Medicine to the Division of Military Application for consideration.

Is the Monitor Research Project Adequate? Dr. Harry has made many fine suggestions but some are debatable. A few of the statements to which exception is taken will be given.

Quoting from page 2,

"----------, even after 10 years of intensive research, no one knows clearly just what the pattern and rate of dispersal of these fission products actually are in the broad region of the western tropical Pacific. No one knows exactly how far the various radioactive materials are carried in the ocean and, outside the Marshall Islands, very little about how fast; no one knows what major radionuclides are present in the tissues of even 1% of the marine organisms concerned, nor how or to what extent they are affected; and most serious of all, no one knows---since the previous questions remain essentially unanswered---all the ways in which these effects can be passed on to man."

Certainly, the program of the radiobiological surveys in the Pacific could not be regarded as intensive. The remainder of the statment can not be called wrong because it is couched in such terms as "knows exactly" or "knows clearly" but the implication is that the program has been directed

poorly and little has been learned. There is no argument that there is much work to be done or very, very much work to be done to know the answers precisely but at the present time we do have good information on the isotopes present, the distribution within species and within tissues of the major group of organisms and some information on the geographical distribution of radioactive contaminants from the testing program.

Quoting from page 3,

"Canned tuna from this fishery is sold and eaten throughout the world; radioactive fish from this fishery would threaten the health and lives of millions of people in many countries."

From what information is now at hand this would seem to be a highly improbable situation. More and continued sampling of the tuna fishery in the vicinity of the test site is needed, however.

Quoting from page 11,

"----- none of their sampling has been on a year-round basis".

Collections have been made on a year-round basis but field parties are not maintained constantly on a year-round basis.

The section "Species Identification" on pages 21-26 appears to be the heart of the proposal. Dr. Harry's greatest interest is in this area, an area in which he can make the greatest contribution. On page 26 he states, "In order to understand the actual effects of radioisotopes on marine life, and thus on man, it is absolutely essential to know 1) the species, habits, physical characteristics, and movement pattern of all samples, 2)----------"

To acquire this specific information for all samples means t at there will be rather complete biological information on a very few organisms and no information on most of the organisms. To do this for all organisms is not feasible. Dr. Harry has pointed out how little is known about most of the marine animals of the Western Pacific. One of the examples is that of the fishes in which he cites the contribution of Dr. Schultz as being great but inadequate. Dr. Schultz who is Curator of Fishes at the U. S. National Museum and an energetic worker is completing this year, after 10 years of work, the fishes of the Marshall and Mariana Islands. If it takes 10 years to identify the fishes alone for one part of the Western tropical Pacific, how can all the groups of organisms for the entire area be identified in three years?

On page 22 the past work has been criticized because it is claimed that "----an appreciable amount of the sampling of specimens for radio-activity has been carried out by taking a general collection of many species, ashing them together and testing the final residue as a single sample." At the University of Washington which has the greatest number of Pacific samples, over 20,000 samples have been prepared but only a very few for special p~~none~~ in this manner. Each sample has been identified by its scientific name, prepared individually and the data for the samples recorded on individual cards. In reporting the data, samples have been grouped under common names, where species differencies were not important, for the convenience of the reader just as Dr. Harry has himself in reporting on the collections he made in the Western Pacific.

A rather naive statement in this section on "Species Identification" occurs on page 24. "This particular species of sea bass may store Strontium-90 under normal circumstances and a high count may have no relation to nuclear tests."

In concluding the remarks on species identification it is to be pointed out that there is no argument that the sample needs to be correctly identified but it would appear that to spend the effort on systematics that is here indicated would mean that other more important areas would be neglected.

The recognition of the problem as being in the fields of biology, radiology and oceanography is quite proper. The location of the sampling stations have been wisely selected but from the program outlined it would appear that there would be a very large collection of samples with the analyses of only a small proportion. As the result of past surveys we have now reached the stage where we wish to place more emphasis on the analyses of samples to determine the isotopes present with less emphasis on the analyses of a great number of samples for gross activity only.

The analyses of samples would be a bottleneck to the Monitor Program. On pages 39 the following statement is made. "The fission product analyses should include radio assays for gross beta and gamma activity and radiochemical determination of at least most of the following individual isotopes." Twenty-one isotopes are then listed. Assuming that analysis is made for only five of the twenty-one isotopes and in only five of the tissues of a fish, then on a schedule of 500 samples per month only 20 fish could be analyzed. This would mean that 1 fish from each of the 20 land stations

per month would be the extent of the isotopic analyses program. Excluded would be all the other fish, all of the other organisms, and all samples from the ocean stations. If the number of samples processed was increased to 800 and the sampling interval to three months, then 4 fish per land station per three months could be analyzed.

If an expanded program is needed are funds available? Captain Musik stated in a telephone call that DMA did not have responsibility to conduct a survey such as suggested in the Monitor Research Project and therefore would not provide funds to support it. Since funds for this project have not been budgeted by DRM it is assumed that funds are not available.

In conclusion it can be said that the Monitoring Research Project can not be supported because funds are not available. As for the program, the AEC interests would be better served if there were more emphasis on the quantitative analysis of the samples and less on systematics. Dr. Harry's group are experienced in collecting samples in the Western Pacific and in the identification of the fishes but do not have experienced personnel for identification of the other groups of organisms, in radiology or in oceanography. The program outlined by Dr. Harry would make a valuable contribution to the knowledge of the fauna of the Western Pacific and would be of some interest to the AEC but the program should be recognised for its major contribution.